Alberta Environment: Report on 2009 Greenhouse Gas Emissions

June 2011

Government of Alberta

Alberta

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Executive Summary

In 2002, Alberta signaled its commitment to manage climate change and greenhouse gas emissions in the province by passing the *Climate Change and Emissions Management Act*. One of the first actions taken under the new legislation was to develop a mandatory reporting program for large industrial emitters in Alberta. Beginning in 2004, large industrial emitters in the province were required to submit an annual report on their previous year's greenhouse gas emissions. The province has now collected data for six consecutive reporting periods, including the 2009 emissions year.

Alberta's regulatory framework has since continued to evolve. In 2007, building from the information collected through the reporting program, Alberta passed the *Specified Gas Emitters Regulation*, reinforcing its commitment to regulate greenhouse gas emissions from large industrial emitters. This regulation requires all facilities in Alberta emitting over 100,000 tonnes of carbon dioxide equivalent per year to reduce their emissions intensity by 12 per cent below a baseline based on 2003-2005 emissions. In the future, Alberta may look to consolidate both regulations to streamline and reduce the overall reporting burden for Alberta's large emitters.

In 2009, the province released its *2008 Climate Change Strategy*, establishing practical, achievable goals for further reductions in greenhouse gas emissions. The strategy commits to taking action on three themes: conserving and using energy efficiently; implementing carbon capture and storage; and greening energy production. By 2050, Alberta has targeted a reduction of 200 megatonnes (one megatonne = one million tonnes) over business-as-usual projections.

Alberta recognizes that continuous changes and targeted actions will be required as we learn more, achieve positive results, and identify new opportunities and solutions. The strategy also reflects Alberta's unique position as an energy supplier to the world and the reality that, for the foreseeable future, the world will continue to rely on Alberta's secure supply of oil and gas. By beginning now to reduce the rate of emissions, Alberta will ensure that significant and lasting reductions will occur.

Results of the 2009 Reporting Program

Alberta collected 2009 greenhouse gas emissions quantities for all facilities in the province whose emissions exceeded the 100 kilotonne (kt) carbon dioxide equivalent (CO_2e) threshold over the calendar year. Total reported greenhouse gas emissions for the 2009 calendar year equalled 113.1 megatonnes (Mt) in carbon dioxide equivalent, from sources of carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Since the *National Mandatory Greenhouse Gas Reporting Program* began, reported Alberta greenhouse gas emissions have increased by 5.7 per cent or 6.4 Mt, from 106.7 Mt in 2004. The number of reporting facilities that exceeded the 100 kt threshold has decreased by two from 92 in 2004 to 90 in 2009.

From 2008, the number of facilities emitting over 100kt that reported emissions decreased by one from 91 to 90, with an increase in total reported emissions by 3.4 per cent from 109.3 Mt. Carbon dioxide accounted for 96.8 per cent of the total emissions with the remainder coming

from methane (2.1 per cent), nitrous oxide (1.1 per cent), hydrofluorocarbons (<0.1 per cent), perfluorocarbons (<0.1 per cent), and sulphur hexaflorine (<0.1 per cent).

Among Alberta's industrial sectors, utilities represented the largest share of 2009 emissions, at 40.5 per cent of the total reported emissions, followed by oil sands operations at 37.1 per cent (consisting of oil sands mining and upgrading at 23.8 per cent and oil sands in situ extraction at 13.3 per cent), chemical manufacturing (5.7 per cent), and conventional oil and gas extraction (5.4 per cent). The remaining 11.5 per cent of emissions came from petroleum and coal products, pipeline transportation, mineral manufacturing, coal mining, fertilizer manufacturing, paper manufacturing and primary metal manufacturing.

In Alberta, 86 per cent of reported emissions were from stationary fuel combustion, with the remainder generated by industrial process (7.4 per cent), venting and flaring (2.7 per cent), fugitive/other (2.0 per cent), on-site transportation (2.1 per cent) and waste and wastewater (<1 per cent) sources.

Across Canada, a total of 249.5 Mt of greenhouse gas emissions were reported in 2009 from facilities whose emissions exceeded 50 kt. Alberta was the largest provincial contributer at 47.0 per cent, due to a large energy industry and a large portion of electricity being supplied by coal-fired power plants. Other major provincial emitters were Ontario (19.6 per cent), Saskatchewan (9.0 per cent), Quebec (8.1 per cent) and British Columbia (5.2 per cent).

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Abbreviations

CH_4:	methane
CO_2:	carbon dioxide
CO_2e:	carbon dioxide equivalent
HFC:	hydrofluorocarbon
kt:	kilotonne
Mt:	megatonne
N_2O:	nitrous oxide
PFC:	perfluorocarbon
SF_6:	sulphur hexafluoride

1 Alberta taking action on climate change

1.1 Goals and policies

The Government of Alberta is committed to reducing provincial greenhouse gas emissions. Alberta's plans are outlined in its *2008 Climate Change Strategy*. The strategy builds on what has already been done: implementing the first legislation of its kind in Canada to reduce greenhouse gas emissions, laying out the long-term roadmap to Alberta's 2020 and 2050 reduction objectives.

The strategy reflects Alberta's unique position as an energy supplier to the world and the reality that, for the foreseeable future, the world will continue to rely on Alberta's secure supply of oil and gas. The strategy also establishes practical, achievable goals for real reductions in greenhouse gas emissions. Instead of setting arbitrary targets, Alberta's approach breaks the problem down into manageable "wedges" for action with corresponding reductions in emissions set for each wedge. Alberta recognizes that continuous changes and targeted actions will be required as we learn more, achieve positive results, and identify new opportunities and solutions.

Alberta's *2008 Climate Change Strategy* commits to taking action on three themes: conserving and using energy efficiently; implementing carbon capture and storage; and greening energy production to transform the way we produce energy and to introduce cleaner, more sustainable approaches to energy production. The strategy also commits to quantitative results:

Year	Goal	Result
2010	Reduce projected emissions by 20 megatonnes	Meet intensity target established in 2002 plan
2020	Reduce projected emissions by 50 megatonnes	Stablilize greenhouse gas emissions and begin reductions
2050	Reduce projected emissions by 200 megatonnes	Emissions reduced by 50 per cent below business as usual levels and 14 per cent below 2005 levels

Alberta's provincial *Specified Gas Reporting Program* is an important aspect of managing climate change, providing real data to inform and enable effective policies for reducing industrial emissions of greenhouse gases. The three main components of the *Specified Gas Reporting Program* are: the *Specified Gas Reporting Standard*, the *Specified Gas Reporting Regulation*, and the *Climate Change and Emissions Management Act*.

The reporting program is intended to work in concert with the *Specified Gas Emitters Regulation*. Information gathered under the program is needed to assist both the province and industry in characterizing emission sources and identifying opportunities for emission reductions. The program provides an annual inventory of greenhouse gas emissions from large industrial facilities in the province and provides a platform for smaller facilities to voluntarily report their greenhouse gas emissions. It also assists the government in monitoring the results of greenhouse gas reduction strategies.

1.2 Specified gas reporting program

The Alberta *Specified Gas Reporting Program* requires that all large Alberta industrial facilities emitting more than 100,000 tonnes of greenhouse gases in carbon dioxide equivalent (CO_2e) units per year—based on the sum of direct emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perflurorocarbons (PFCs) and sulphur hexafluoride (SF_6)—report their greenhouse gas emissions to Alberta Environment. Facilities that do not exceed the 100 kt regulatory threshold may voluntarily report their emissions under the *Specified Gas Reporting Program*. Note that Alberta has now reduced its emissions threshold to 50,000 tonnes CO_2e effective for the 2010 emissions year.

Facilities are required to submit greenhouse gas emissions reports through an electronic data reporting system, which is administered by Environment Canada. In 2005 (for 2004 emissions collection), Alberta harmonized its *Specified Gas Reporting Program* with the *National Mandatory Greenhouse Gas Reporting Program*. Alberta has jointly collected greenhouse gas data from Alberta's largest industrial emitters with the Government of Canada since 2004. Alberta facilities report once through the federal electronic data reporting system and results are forwarded to Alberta Environment in order to satisfy both provincial and federal reporting requirements. Alberta facilities are required to submit separate confidentiality requests directly to both Environment Canada and Alberta Environment.

1.3 Specified gas emitters regulation

The *Specified Gas Emitters Regulation* came into force on July 1, 2007 and is an important step in delivering on Alberta's *2008 Climate Change Strategy*.

The *Specified Gas Emitters Regulation* requires all facilities in Alberta emitting over 100,000 tonnes of carbon dioxide equivalent (CO_2e) per year to reduce their emissions intensity by 12 per cent below a 2003-2005 baseline. For new facilities—those that began operation on or after January 1, 2000 and have completed less than 8 years of commercial operation—the 12 per cent target is phased-in at 2 per cent per year starting in their fourth year of commercial operations. Facilities have multiple options to meet their emissions intensity reduction targets:

- Improve facility operations and efficiency;
- Pay $15 per tonne of CO_2e into the Climate Change and Emissions Management Fund, which creates a pool of resources to enable additional projects or technology aimed at reducing greenhouse gas emissions in the province;
- Purchase emissions offset credits from the Alberta Emissions Offset Registry generated by projects not subject to the *Specified Gas Emitters Regulation*.; or
- Purchase emission performance credits from *Specified Gas Emitters Regulation* facilities that have reduced their emissions intensity beyond their reduction target.

Facilities exceeding the 100,000 tonnes CO_2e emissions threshold must satisfy the requirements of both the *Specified Gas Emitters Regulation* and the *Specified Gas Reporting Regulation*. Data collected under the *Specified Gas Emitters Regulation* may be used to update emissions reported for the *Specified Gas Reporting Regulation* as it must be third party verified and is often more accurate.

2 Specified gas reporting regulation annual report

2.1 Objective

This report is designed to communicate results from the 2009 reporting year of the *Specified Gas Reporting Program* and provide analysis of those results that are not provided elsewhere to Albertans. This report builds on previous annual reports available at www.environment.alberta.ca/2881.html.

2.2 Report content

Greenhouse gas data for the 2009 calendar year includes only facilities emitting over 100 kt, collected under the *Specified Gas Reporting Regulation*, is examined by greenhouse gas type, source category, facility, and the industrial sector. Emissions data from 2009 is also compared to emissions from past years of specified gas reporting.

2.3 About the data

This report uses data from the *Specified Gas Reporting Program* that is current as of September, 2010. Any changes to the Alberta or national greenhouse gas databases after this date are not reflected in this report. Rounding of emissions data has been done to present workable numbers in this report. As a result, the numbers presented in this report may differ slightly in sections of this report and may also differ slightly from the same data presented from other sources. This report uses greenhouse gas emissions data from two sources: the Alberta *Specified Gas Reporting Program* and the *National Mandatory Greenhouse Gas Reporting Program*.

Greenhouse gas emissions data for 2003 through 2009 was collected in accordance with the *Climate Change & Emissions Management Act*, *Specified Gas Reporting Regulation*, and the associated *Specified Gas Reporting Standard*. Emissions data for 2004 through 2009 was collected through the national one-window reporting system.

Aggregated greenhouse gas data for facilities across Canada was collected through the *National Mandatory Greenhouse Gas Reporting Program*, under the authority of the *Canadian Environmental Protection Act*, 1999 and is published on Environment Canada's website at http://www.ec.gc.ca/ges-ghg.

2.4 Data changes

The 2009 greenhouse gas data presented in this report was collected using the March 2010 *Specified Gas Reporting Standard*. There may have been updates to portions of the 2003-2008 data sets used to develop this report. Consequently, data presented in this report may differ from what was published in previous Alberta Environment greenhouse gas reports.

2.5 Changes to reporting

There have been some changes to the way data is being reported by Alberta Environment for the 2009 greenhouse gas emissions data collected under the *Specified Gas Reporting Program* compared to previous reporting years. The sectoral breakdown of industrial facilities has been

classified based on the reported North American Industrial Classification System (NAICS) code and grouped into the following industrial sectors:

Chemical Manufacturing
Coal Mining
Conventional Oil and Gas Extraction
Fertilizer Manufacturing
Mineral Product Manufacturing
Oil Sands In Situ Extraction
Oil Sands Mining and Upgrading
Paper Manufacturing
Petroleum and Coal Products
Pipeline Transportation
Primary Metal Manufacturing
Utilities

2.6 Data quality and program enforcement

The 2009 greenhouse gas emissions data that was collected under the *Specified Gas Reporting Program* has undergone several checks by Alberta Environment, Environment Canada and Statistics Canada to ensure facilities exceeding the threshold complied with the reporting requirement and to attempt to identify major errors in submitted data. As these are reported values, it is encumbent upon reporting facilities to submit the most accurate greenhouse gas emissions data possible.

Reporting to the *Specified Gas Reporting Program* is a mandatory regulatory requirement for Alberta facilities exceeding 100 kt CO_2e in annual greenhouse gas emissions (note that this threshold has now been changed to 50 kt CO_2e for the 2010 reporting period and forward). Facilities are required to retain all records, data and information used in the preparation of a specified gas report for at least three years after the report is submitted. These regulatory requirements ensure that facilities are submitting reasonably correct emissions information and that there is a paper trail in case Alberta Environment needs to verify the submitted emissions data. Facilities that fail to meet the regulatory requirements of the *Specified Gas Reporting Program* could face enforcement action. Additional information on enforcement can be found by consulting the *Specified Gas Reporting Regulation*, *Administrative Penalty Regulation* and the *Climate Change and Emissions Management Act*.

The *Specified Gas Reporting Program* has no requirement for facilities to use consistent methods across different reporting years, no requirement for similar facilities to use the same calculation methods, and no requirement for a provincial or national auditing program. The program provides an inventory of greenhouse gas emissions in the province for large emitters only, and does not include smaller sources of emissions.

3 Reported 2009 Alberta greenhouse gas emissions

3.1 Total reported greenhouse gas emissions by sector

In total, 90 facilities from 11 industrial sectors reported a total of 113.1 Mt CO_2e of greenhouse gas emissions in Alberta for the 2009 calendar year through the *Specified Gas Reporting Program*. Reported greenhouse gas emissions for each facility can be found the accompanying spreadsheet document. The total reported greenhouse gas emissions and the number of facilities reporting, for each industrial sector, are shown in Table 1.

Table 1: Total reported greenhouse gas emissions and report tally by industrial sector.

Sector	Reports Received	Emissions (kt CO2e)	Percent of Total
Chemical Manufacturing	8	6,394	5.7%
Coal Mining	2	398	0.4%
Conventional Oil and Gas Extraction	23	6,120	5.4%
Fertilizer Manufacturing	5	3,734	3.3%
Mineral Product Manufacturing	3	1,588	1.4%
Oil Sands In Situ Extraction	16	15,010	13.3%
Oil Sands Mining and Upgrading	6	26,933	23.8%
Paper Manufacturing	2	283	0.3%
Petroleum and Coal Products	3	3,807	3.4%
Pipeline Transportation	4	2,686	2.4%
Primary Metal Manufacturing	1	309	0.3%
Utilities	17	45,856	40.5%
Total	**90**	**113,118**	**100.0%**

The utilities sector reported the largest share of 2009 greenhouse gases in Alberta, emitting 40.5 per cent of total reported emissions, followed by oil sands operations, emitting 37.1 per cent of total reported emissions. The chemical manufacturing sectors was also a significant source of emissions, emitting 5.7 per cent of the total reported emissions. The conventional oil and gas extraction sector emitted 5.4 per cent of total reported emissions, and petroleum and coal products emitted 3.4 per cent of total reported emissions. Facilities in the pipeline transportation, mineral manufacturing, paper manufacturing, coal mining, and fertilizer manufacturing sectors together accounted for the remaining 11.5 per cent of total reported emissions. The contribution of total reported greenhouse gas emissions by industrial sector is depicted in Figure 1.

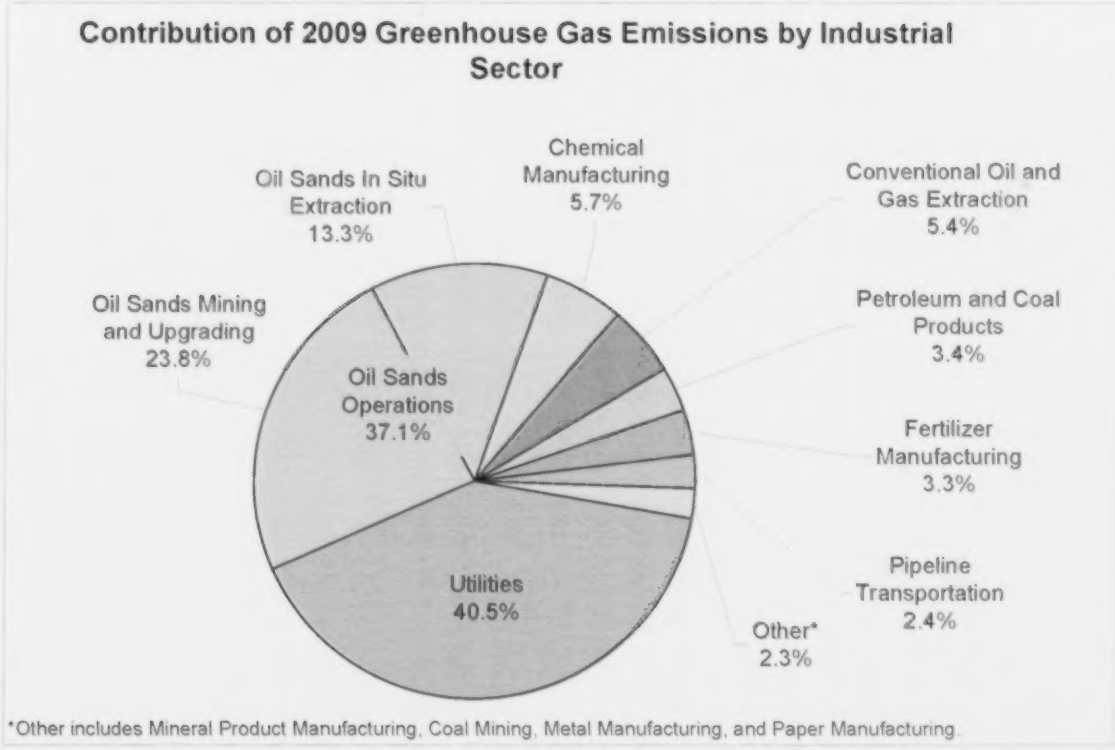
Contribution of 2009 Greenhouse Gas Emissions by Industrial Sector
Oil Sands In Situ Extraction 13.3%
Chemical Manufacturing 5.7%
Conventional Oil and Gas Extraction 5.4%
Oil Sands Mining and Upgrading 23.8%
Petroleum and Coal Products 3.4%
Oil Sands Operations 37.1%
Fertilizer Manufacturing 3.3%
Utilities 40.5%
Pipeline Transportation 2.4%
Other* 2.3%
*Other includes Mineral Product Manufacturing, Coal Mining, Metal Manufacturing, and Paper Manufacturing.

Figure 1: Total reported 2009 Alberta greenhouse gas emissions by industrial sector.

3.2 Total greenhouse gas emissions by gas type

The Alberta *Specified Gas Reporting Program* requires six greenhouse gases to be reported: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbon (HFC) species, perfluorocarbon (PFC) species, and sulphur hexafluoride (SF_6). The emitted mass of each gas is converted to carbon dioxide equivalent units using the global warming potential values detailed in the *Specified Gas Reporting Standard*, and summed to compute total emissions. Of the 90 reporting facilities, all 90 reported carbon dioxide emissions, 88 reported methane and nitrous oxide emissions, two reported emissions of hydrofluorocarbons, and one reported emissions of perfluorocarbons. No sulphur hexafluoride emissions were reported for 2009.

The largest portion of reported greenhouse gas emissions by CO_2e was CO_2, contributing 96.8 per cent of the total with 109.5 Mt. The remainder consisted of CH_4 (2.1 per cent or 2.4 Mt CO_2e), N_2O (1.1 per cent or 1.2 Mt CO_2e), HFCs (<0.1 per cent or 5 kt CO_2e) and PFC (<0.1 per cent or 0.2 kt CO_2e). The contribution of total reported greenhouse gas emissions by gas type is depicted in Figure 2.

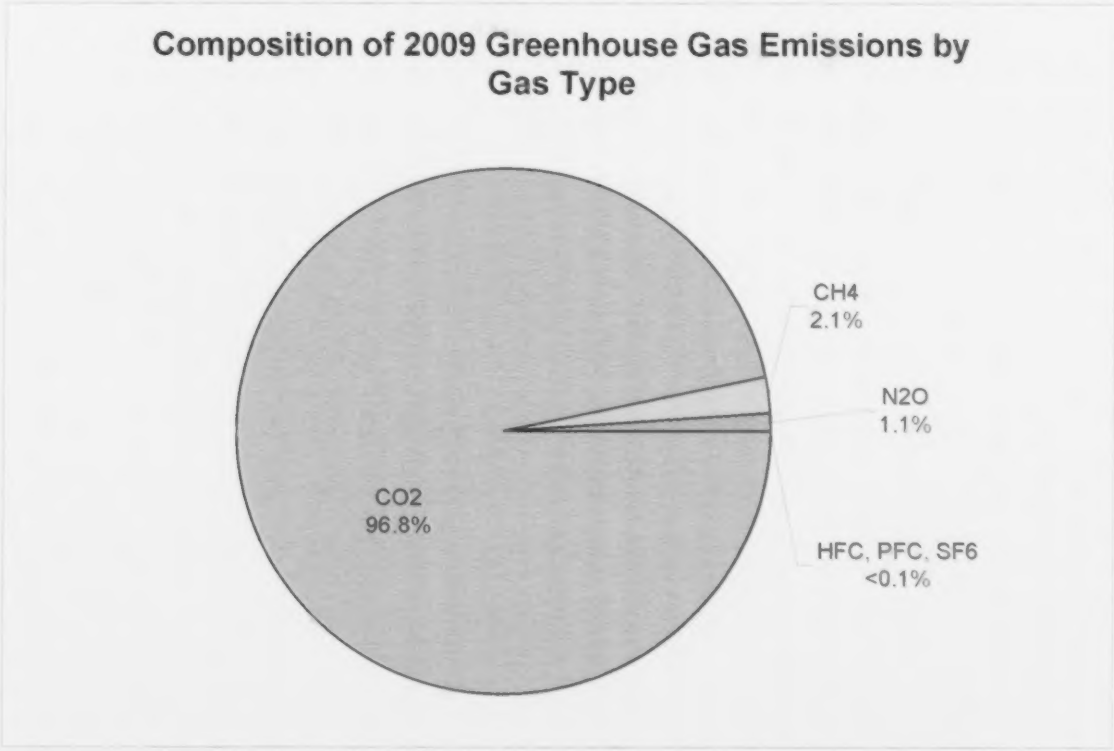

Figure 2: Total reported 2009 Alberta greenhouse gas emissions by gas type.

3.3 Distribution of total greenhouse gas emissions by facility

Among the 90 facilities in Alberta that reported greenhouse gas emissions for 2009, a varied distribution of emissions totals can be observed at the facility level. Out of the 113.1 Mt CO_2e total reported emissions, or 100.0 Mt (88.4 per cent) was reported by only 35 facilities, while the other 55 facilities account for the remaining 13.1 Mt. The eight largest emitters each reported greater than four megatonnes and together account for 65.0 Mt (57.5 per cent of total reported emissions). Of the eight largest emitters, five facilities are in the utilities sector, two are in the oil sands mining and upgrading sector, and one is in the oil sands in situ extraction sector. The distribution of 2009 facility emissions in order of decreasing magnitude is shown in Figure 3.

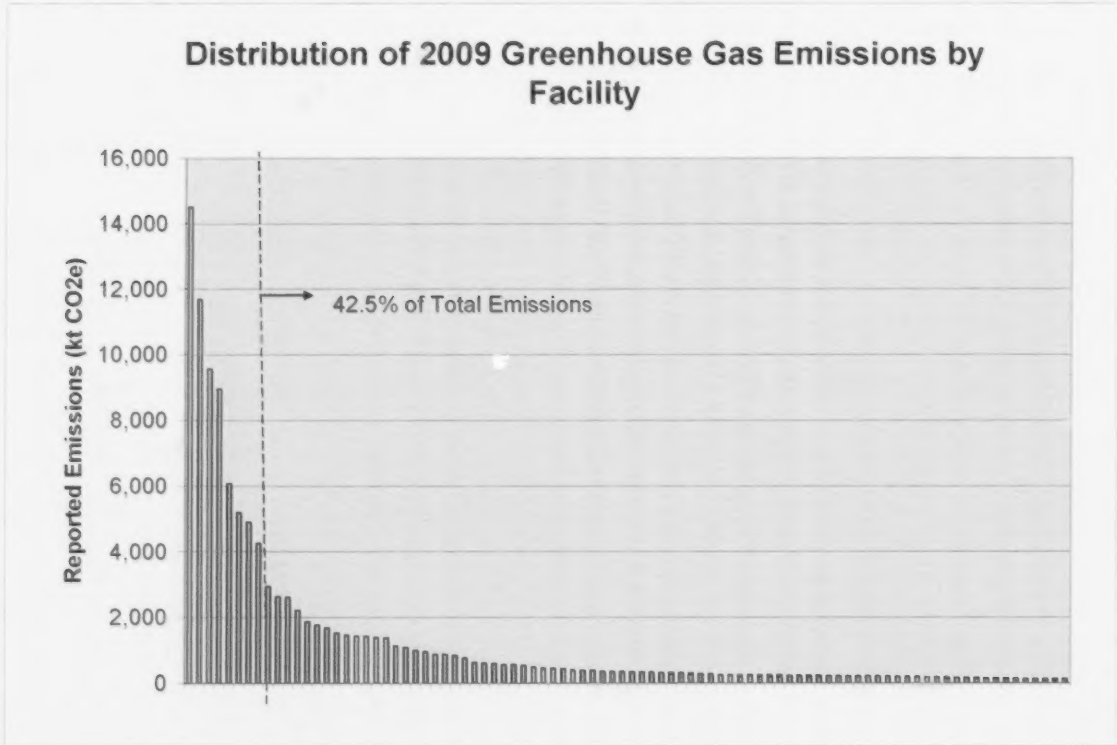

Figure 3: Distribution of reported 2009 Alberta greenhouse gas emissions by facility.

3.4 Reported emissions by industrial sector and gas type

While CO_2 contributed the largest portion of total reported emissions, the contribution from each greenhouse gas varied across industrial sectors, as shown in Figure 4. Carbon dioxide contributed more than 90 per cent of greenhouse gas emissions for eight industrial sectors, including utilities, oil sands mining and upgrading, oil sands in situ extraction, chemical manufacturing, conventional oil and gas extraction, petroleum and coal products, primary metal manufacturing, and mineral manufacturing, and was the majority contributor in the pipeline transportation, coal mining, fertilizer manufacturing and paper manufacturing sectors. Methane was the majority greenhouse gas contrubitor in only one sector (coal mining), but contributed greater than 10 per cent in the pipeline transportation sectors. Nitrous oxide contributed 10 per cent of greenhouse gas emissions in the paper manufacturing and fertilizer manufacturing sectors, 6 per cent in oil mining and upgrading and pipeline transportation sectors, and less than 2 per cent in all other sectors. Emissions of HFCs and SF_6 were reported in small quantities and are excluded from Figure 4.

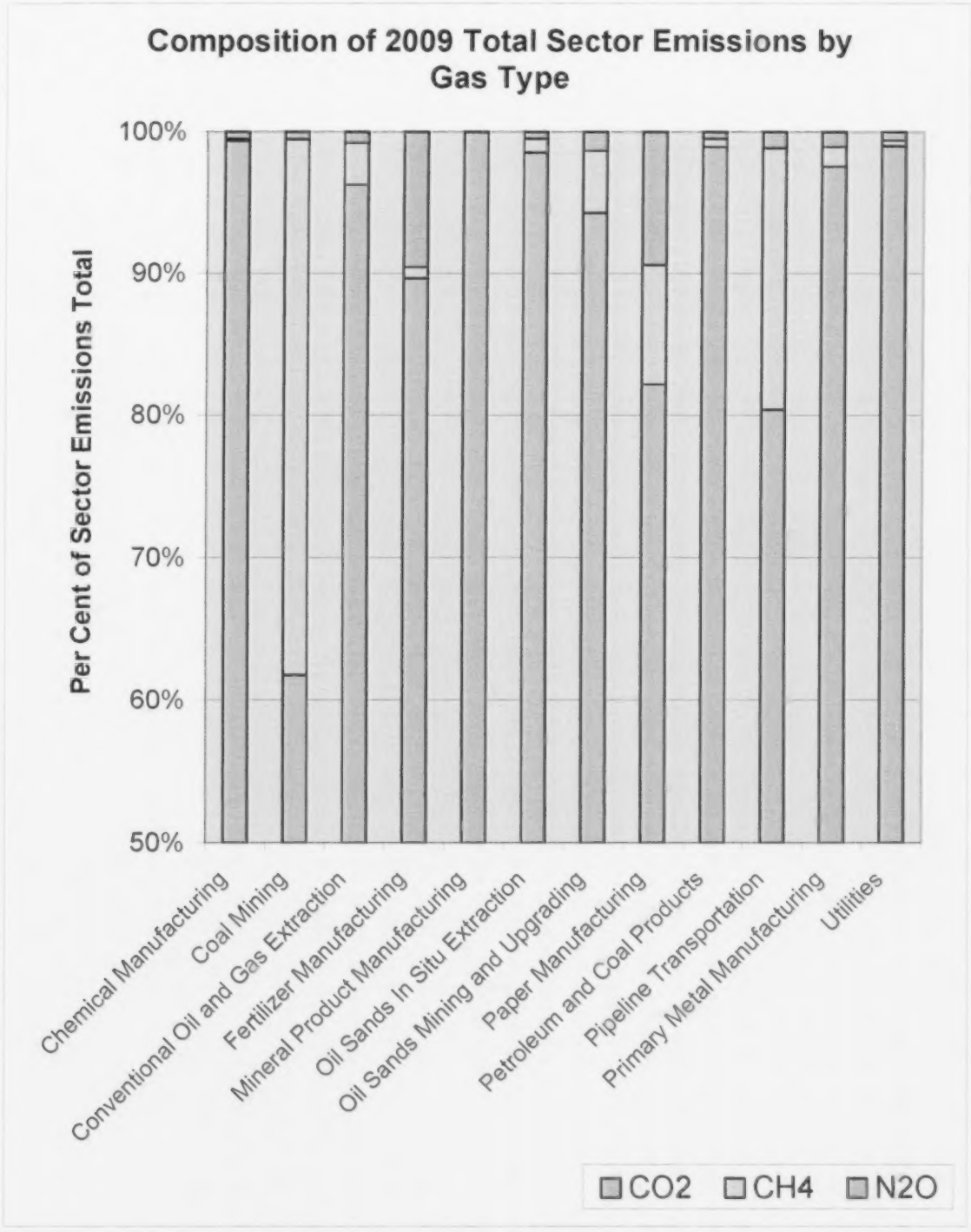

Figure 4: Reported 2009 greenhouse gas emissions for each industrial sector by gas type.

4 Reported 2009 Alberta greenhouse gas emissions by source category

The Alberta *Specified Gas Reporting Program* requires greenhouse gas emissions to be reported according to six source categories: stationary fuel combustion, industrial process, fugitive/other, venting and flaring, on-site transportation, and waste and wastewater. A description of the source categories can be found in the Glossary of Terms.

4.1 Total reported emissions by source category

Stationary fuel combustion was the largest source of greenhouse gases, emitting 96.8 Mt. The second largest source was industrial process, emitting 8.4 Mt. The remaining 7.0 per cent of total reported emissions was from venting/flaring, fugitive/other, on-site transportation, and waste and wastewater sources. The contribution of each source category to the total 2009 reported emissions is shown in Figure 5.

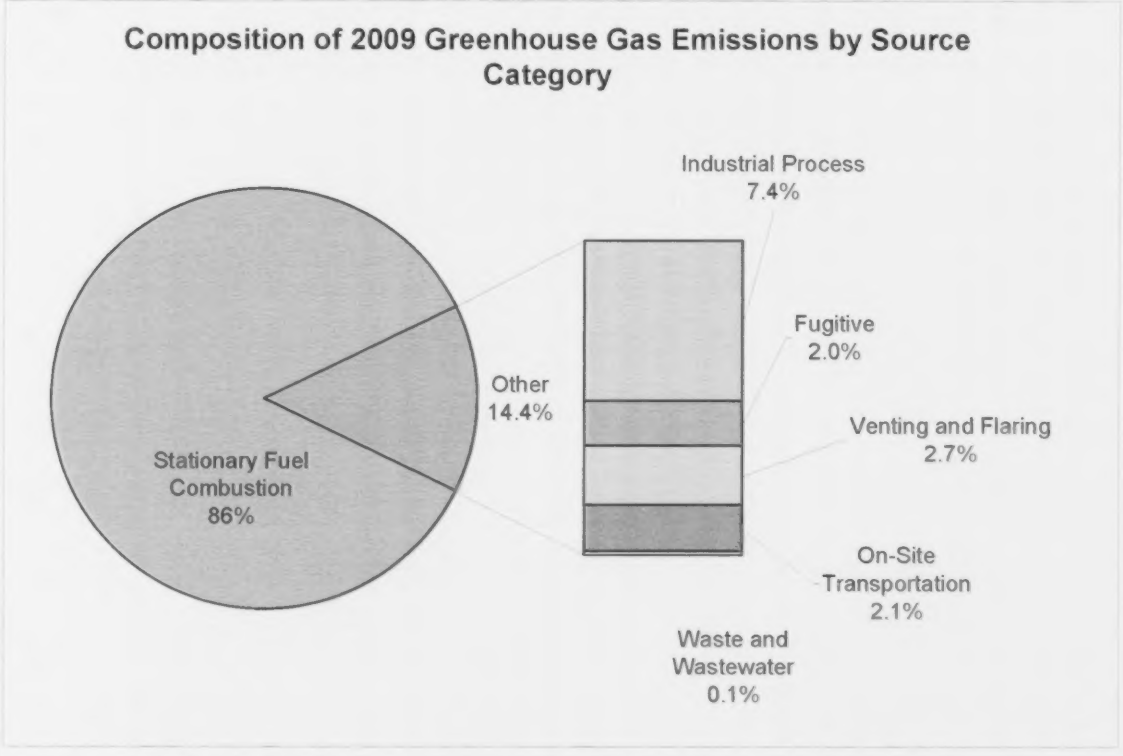

Figure 5: Total reported 2009 greenhouse gas emissions by source category.

4.2 Sectoral emissions by source category

In ten of twelve industrial sectors, stationary fuel combustion contributed the majority of greenhouse gas emissions. In the mineral manufacturing sector, industrial process emissions were the majority contributor, largely due to calcination processes occurring at these facilities. The fertilizer manufacturing sector reported an almost even split between stationary fuel

combustion emissions and industrial process emissions, with the former representing the thin majority. Transportation emissions were the the majority contributor in the coal mining sector, primarily due to hauling of mined coal. The relative contribution of each source category to total reported emissions in each industrial sector is shown in Figure 6.

4.3 Source category emissions by industrial sector

The relative contribution of each industrial sector to total reported emissions in each source category is shown in Figure 7. The stationary fuel combustion emissions sectoral composition is similar to the sectoral composition of total 2009 emissions shown in Figure 1. This similarity is not surprising, since stationary fuel combustion was the dominant source of total emissions, as noted in Section 3.2. The utilities sector was the largest source of stationary fuel combustion emissions, followed by oil sands mining and upgrading, oil sands in situ extraction, and chemical manufacturing. The largest contributors in the industrial process category were oil sands mining and upgrading, fertilizer manufacturing, chemical manufacturing, and mineral manufacturing. The largest portion of fugitive/other emissions came from the oil sands mining and upgrading sector, and the largest portion of venting and flaring emissions came from the conventional oil and gas sector. The oil sands mining and upgrading sector was also the largest contributor in the on-site transportation emissions category and the waste and wastewater emissions category.

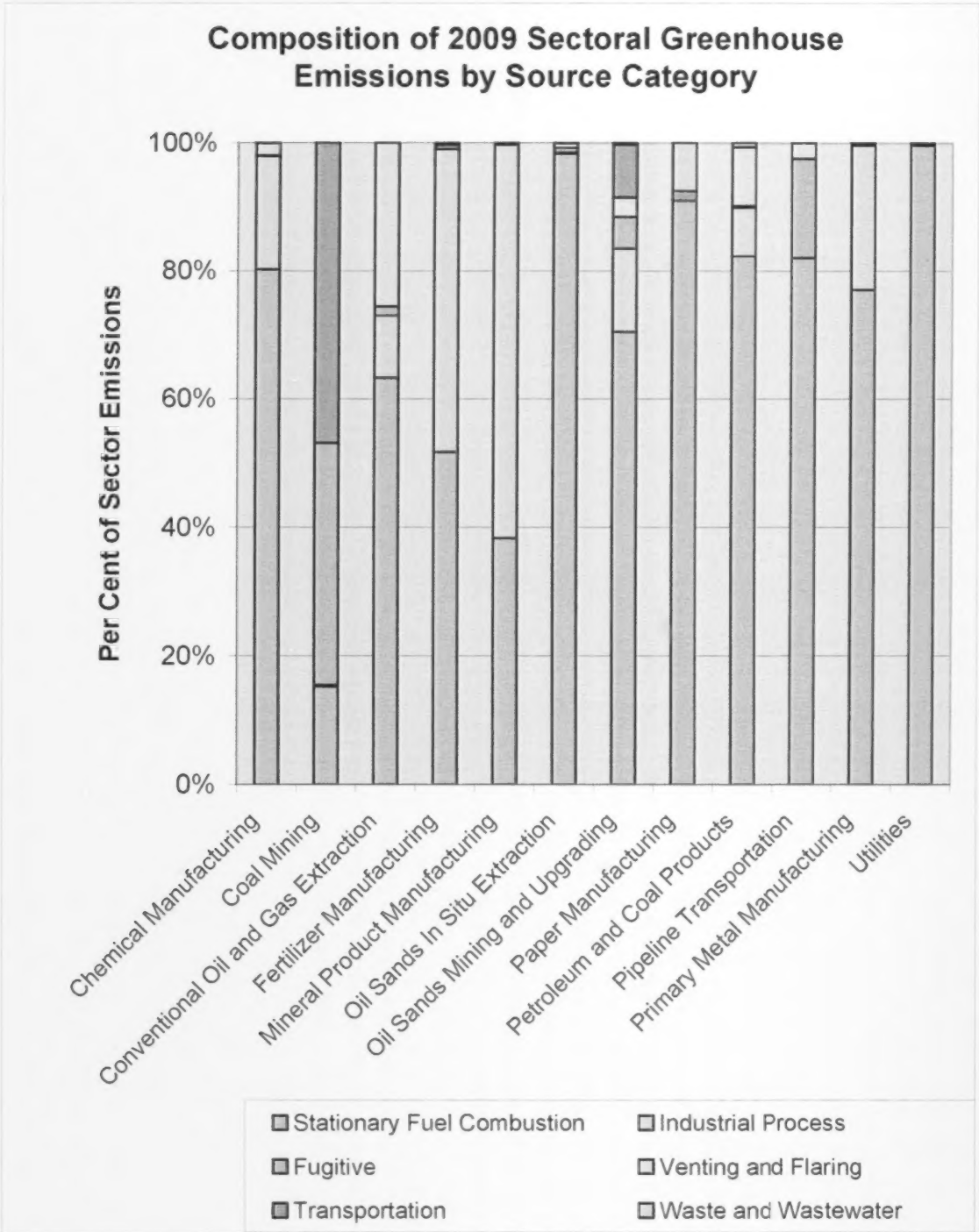

Figure 6: Total reported industrial sector emissions by source category.

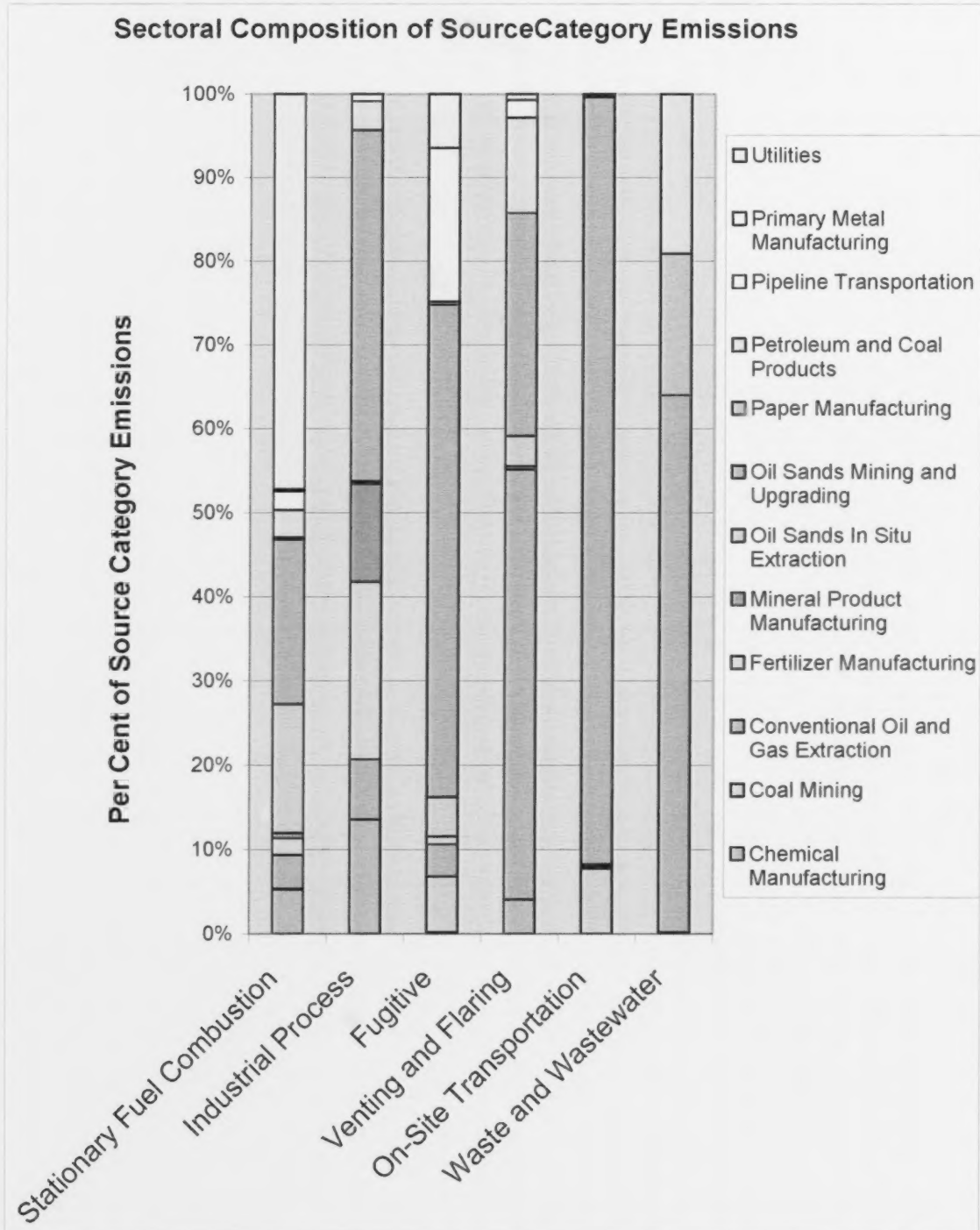

Figure 7: Total reported source category emissions by industrial sector.

5 Comparision with previous reporting periods

The 2009 calendar year marks the seventh consecutive year of mandatory greenhouse gas reporting for large industrial facilities in Alberta. Short-term and long-term trends in reported greenhouse gas emissions in Alberta are investigated in this section.

Note: Comparability of reported emissions between reporting years is limited due lack of information and consistency regarding calculation methods used to estimate emissions inventories, and variation in the annual facility list from facilities exceeding or falling below the reporting threshold in subsequent years, decommissioning, and reporting voluntarily. Only emissions reported through the federal harmonized one-window Electronic Data Reporting System are included in this analysis, which excludes data received for 2003.

5.1 Short-term trend: comparison of 2008 and 2009 reported greenhouse gas emissions

The total reported greenhouse gas emissions from Alberta facilities exceeding 100kt increased by 3.8 Mt from 109.3 Mt to 113.1 Mt between 2008 and 2009. Concurrently, the number of facilities emitting above 100kt that reported greenhouse gase emissions decreased from 91 to 90. By sector, the number of reports received increased in the conventional oil and gas extraction, oil sands in situ extraction, and utilities sectors, decreased in the chemical manufacturing, coal mining and paper manufacturing sectors, and held constant in the remaining sectors. A comparison of total reported emissions and number of reports received by sector for 2008 and 2009 is shown in Table 2.

Table 2: Number of reports received and total reported emissions by sector for 2008 and 2009.

	Facilities Reporting		Emissions (kt CO2e)	
Sector	**2008**	**2009**	**2008**	**2009**
Chemical Manufacturing	9	8	6,173	6,394
Coal Mining	3	2	497	398
Conventional Oil and Gas Extraction	22	23	6,069	6,120
Fertilizer Manufacturing	5	5	4,410	3,734
Mineral Product Manufacturing	3	3	2,108	1,588
Oil Sands In Situ Extraction	15	16	12,138	15,010
Oil Sands Mining and Upgrading	6	6	24,538	26,933
Paper Manufacturing	4	2	478	283
Petroleum and Coal Products	3	3	3,862	3,807
Pipeline Transportation	4	4	2,797	2,686
Primary Metal Manufacturing	1	1	292	309
Utilities	16	17	45,933	45,856
Total	**91**	**90**	**109,295**	**113,118**

The change in total reported emissions from 2008 to 2009 for each industrial sector is illustrated in Figure 8. Relatively small increases in sectoral emissions were reported in the chemical manufacturing, and conventional oil and gas extraction sectors. Decreases of a larger magnitude, but less than 1 Mt, were reported in the utilities, pipeline transportation, petroleum and coal

products, paper manufacturing, mineral product manufacturing, fertilizer manufacturing and coal mining sectors. Negligible change was reported in the primary metal manufacturing sectors. The most notable changes occurred in the oil sands in situ extraction and oil sands mining and upgrading sectors. An increase of over 2 Mt was reported by the oil sands in situ extraction sector and the oil sands mining and upgrading sector.

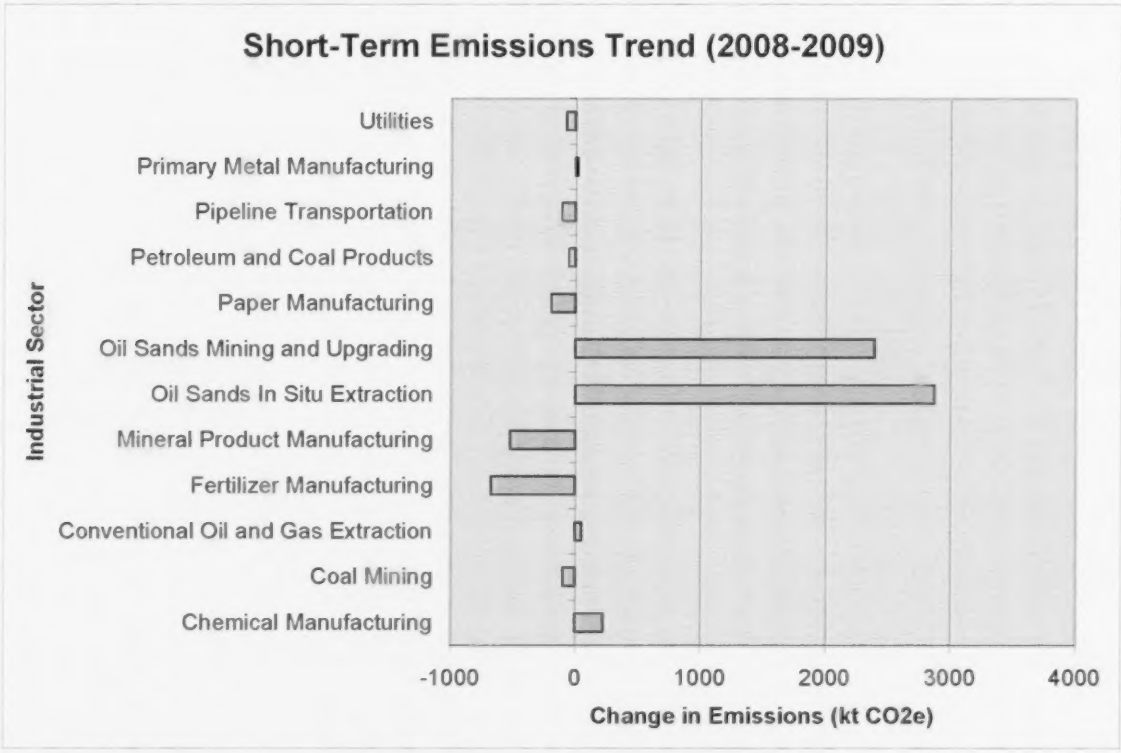

Figure 8: Change in total reported greenhouse gas emissions by industrial sector from 2008 to 2009.

5.2 Long-term trend: comparison of 2004 and 2009 reported greenhouse gas emissions

From 2004 to 2009, the total number of facilities whose emissions exceeded 100kt in Alberta decreased from 92 to 90. Concurrently, the total reported emissions increased by 5.7 per cent from 106.7 Mt to 113.1 Mt. By sector, the largest changes in the number of facilities reporting were seen in the conventional oil and gas and oil sands in situ extraction sectors. A comparison of total reported emissions and number of reports received by sector for 2004 and 2009 is shown in Table 3.

Table 3: Number of reports received and total reported emissions by sector for 2004 and 2009.

	Facilities Reporting		Emissions (kt CO2e)	
Sector	**2004**	**2009**	**2004**	**2009**
Chemical Manufacturing	10	8	7,026	6,394
Coal Mining	1	2	185	398
Conventional Oil and Gas Extraction	31	23	8,523	6,120
Fertilizer Manufacturing	5	5	4,673	3,734
Mineral Product Manufacturing	3	3	2,134	1,588
Oil Sands In Situ Extraction	9	16	7,664	15,010
Oil Sands Mining and Upgrading	5	6	21,587	26,933
Paper Manufacturing	3	2	390	283
Petroleum and Coal Products	3	3	3,938	3,807
Pipeline Transportation	4	4	3,232	2,686
Primary Metal Manufacturing	1	1	276	309
Utilities	17	17	47,040	45,856
Total	**92**	**90**	**106,667**	**113,118**

Some similarities noted in the short-term trend are also visible in the longer-term trend, illustrated in Figure 9. For example, small or negligible changes in reported emissions are seen in the paper manufacturing, petroleum and coal products and primary metal manufacturing sectors. The fertilizer manufacturing sector reported significant decreases in both the short term and the long term, and the oil sands in situ extraction and oil sands mining and upgrading sectors similarly reported significant increases. In the fertilizer manufacturing sector, reported greenhouse gas emissions declined by greater than 15 per cent, but the number of facilities remained the same. In the oil sands in situ extraction sector, the number of facilities increased from 9 to 16, with an emissions increase of 7.3 Mt. In the oil sands mining and upgrading sector, the number of reporting facilities increased by one, with emissions increasing by 5.4 Mt. Other notable trends that are less consistent with the short-term observations include a moderate decrease of emissions in the chemical manufacturing and conventional oil and gas extraction sectors.

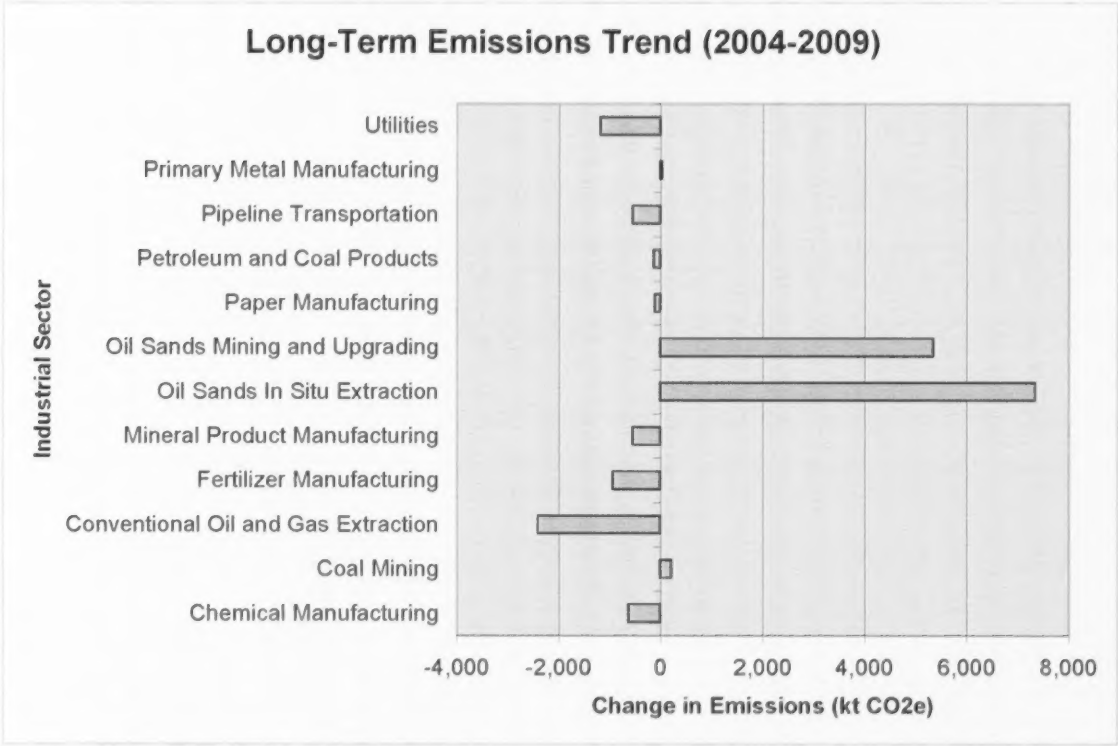

Figure 9: Change in reported total greenhouse gas emissions by sector from 2004 to 2009.

5.3 Comparable facilities

With a mandatory reporting threshold of 100,000 tonnes, it can be meaningful to remove the effects of facilities rising and falling below the threshold. For this purpose, the concept of comparable facilities is used. Comparable facilities are all facilities that have reported greenhouse gas emissions in every year from 2004 to 2009, of which there are 75. The total reported emissions from 2004 to 2009, for comparable facilities, are shown in Table 4. In the short term, the reported greenhouse gas emissions have decreased from 95.9 Mt in 2008 to 95.0 Mt in 2009, but have increased slightly from 94.6 Mt in 2004.

Table 4: Total annual reported greenhouse gas emissions for comparable facilities in Alberta.

	2004	2005	2006	2007	2008	2009
Total Reported Emissions (Mt CO2e)	94.6	95.0	100.2	98.7	95.9	95.0

6 National reported greenhouse gas emissions

This section of the report examines the 2009 greenhouse gas emissions data for facilities that emitted over 50 kt, collected through the harmonized one-window Electronic Data Reporting System for all of Canada.

6.1 2009 reported greenhouse gas emissions by province

A total of 249.5 Mt of greenhouse gas emissions were reported by large industrial facilities emitting above 50kt in Canada for the 2009 reporting period. The proportional contribution from provinces and territories to the national reported emissions is shown in Figure 10. The 149 facilities located in Alberta were the source of the largest portion of total reported greenhouse gas emissions, contributing 47.0 per cent of the total. Facilities in Ontario reported the next largest share, with 19.6 per cent of the total (48.8 Mt). Facilities in Saskatchewan and Quebec accounted for 9.0 and 8.1 per cent of total, at 22.4 Mt and 20.3 Mt, respectively. Facilities in British Columbia contributed 5.2 per cent of the total (12.9 Mt), facilities in Nova Scotia 4.3 per cent (10.7 Mt), and facilities in New Brunswick 4.1 per cent (10.1 Mt). The remaining provinces and territories—including Newfoundland and Labrador, Manitoba, the Northwest Territories, Nunavut, the Yukon, and Prince Edward Island—contributed a combined total of 2.8 per cent of reported emissions (7.0 Mt).

6.2 2009 facility greenhouse gas emissions as a portion of total provincial emissions

It is important to note that emissions reported through the *National Mandatory Greenhouse Gas Reporting Program* represent only a fraction of total greenhouse gas emissions from each province. Total greenhouse gas emissions for Canada and each province/territory are described in the *National Inventory Report: 1990-2009*, published by Environment Canada. For 2009, the emissions reported through the mandatory industrial reporting program as a portion of total provincial emissions described in the inventory is shown are Figure 11. Greenhouse gas emissions from large industrial facilities represent varying fractions of the provincial inventory, as high as 55 per cent for New Brunswick and as low as 4 per cent for Prince Edward Island.

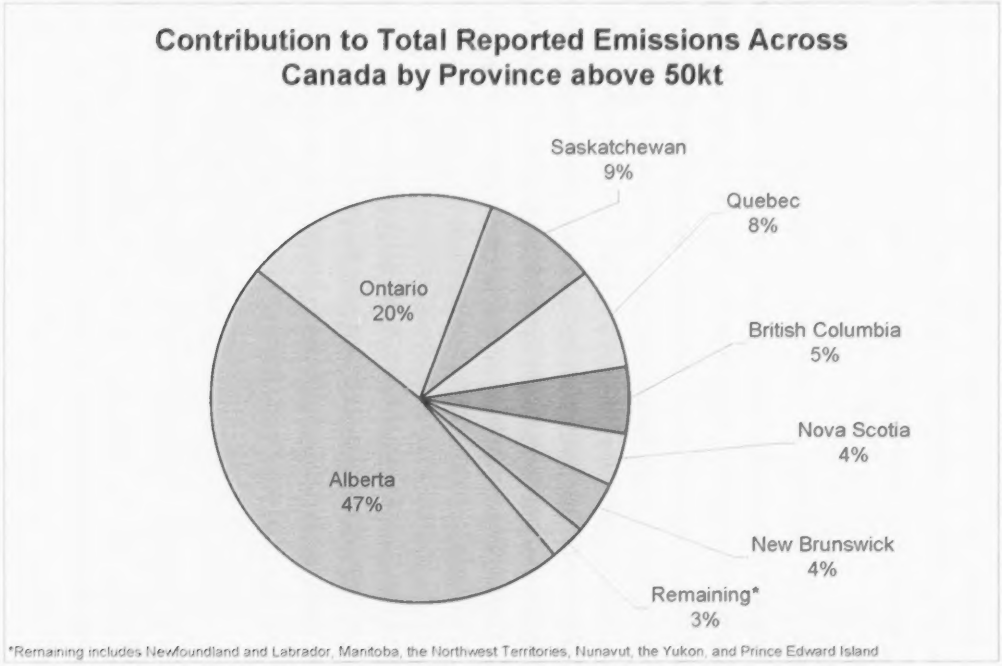
Contribution to Total Reported Emissions Across Canada by Province above 50kt
Saskatchewan 9%
Quebec 8%
Ontario 20%
British Columbia 5%
Nova Scotia 4%
Alberta 47%
New Brunswick 4%
Remaining* 3%
*Remaining includes Newfoundland and Labrador, Manitoba, the Northwest Territories, Nunavut, the Yukon, and Prince Edward Island

Figure 10: Total reported facility greenhouse gas emissions across Canada by Province/Territory.

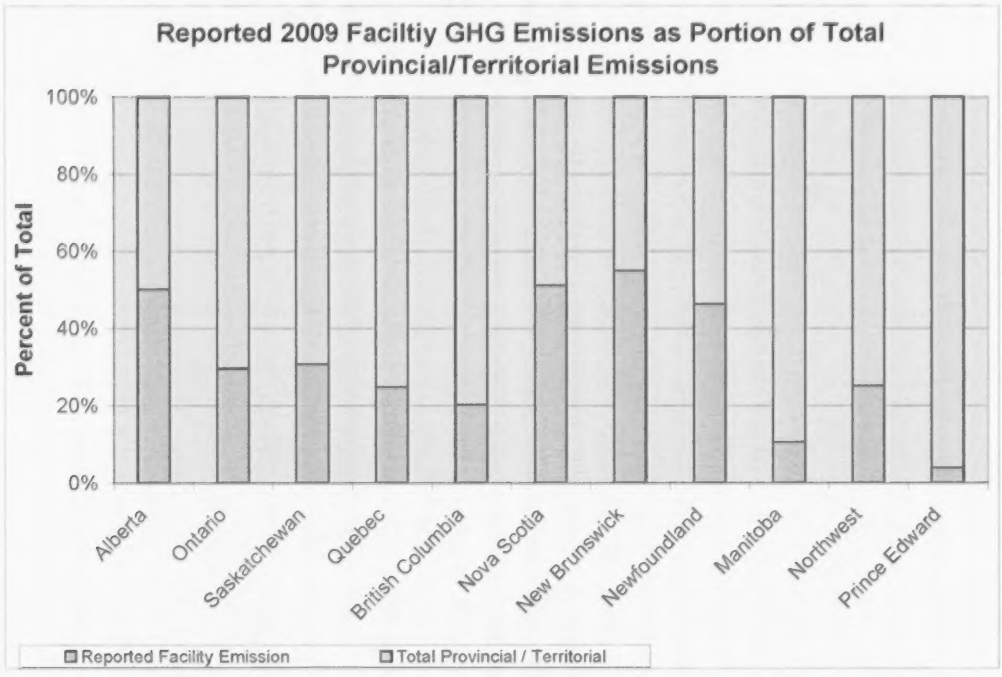

Figure 11: Reported 2009 facility greenhouse gas emissions as a percentage of total estimated provincial/territorial emissions.

7 Data confidentiality and access

7.1 Confidentiality request process

The *Specified Gas Reporting Regulation* sets out confidentiality provisions for data collected under the *Regulation*. Section 5 of the *Regulation* permits facilities subject to the *Regulation* to request confidentiality for some or all of the information in their specified gas report. Confidentiality may be requested and granted for up to five years if the information is proved to be commercial, financial, scientific or technical information that would reveal proprietary business, competitive or trade secret information about a specific facility, technology or corporate initiative. The request from the facility needs to state exactly what is being requested to be held confidential and for what reasons it should be deemed confidential.

The following factors are considered during the confidentiality review process:

- Whether disclosure could reasonably be expected to significantly harm the competitive position of the specified gas reporter;
- Whether disclosure could reasonably be expected to interfere significantly with the negotiating position of the specified gas reporter;
- Whether disclosure could reasonably be expected to result in undue financial loss or gain to any person or organization;
- The availability of the information from other public sources; and
- Whether there are any other competing interests that would suggest disclosure of the information is warranted.

The Director under the *Climate Change and Emissions Management Act* has 90 days to review and reach a decision on each confidentiality request. The Director can also grant a portion or the entire request by deeming the information to be held as confidential for up to five years. Decisions on the 2009 confidentiality requests were made by August 29, 2010 and letters were sent to the designated certifying official of the requesting facility to inform them of the decision.

Section 8 of the *Regulation* requires the designated Director to submit a report on confidentiality requests to the Information and Privacy Commissioner. In accordance with the *Regulation*, the report must contain: the number of confidentiality requests received, number of confidentiality requests approved and the period of time prescribed for each approved request. The confidentiality process is outlined in Figure 12.

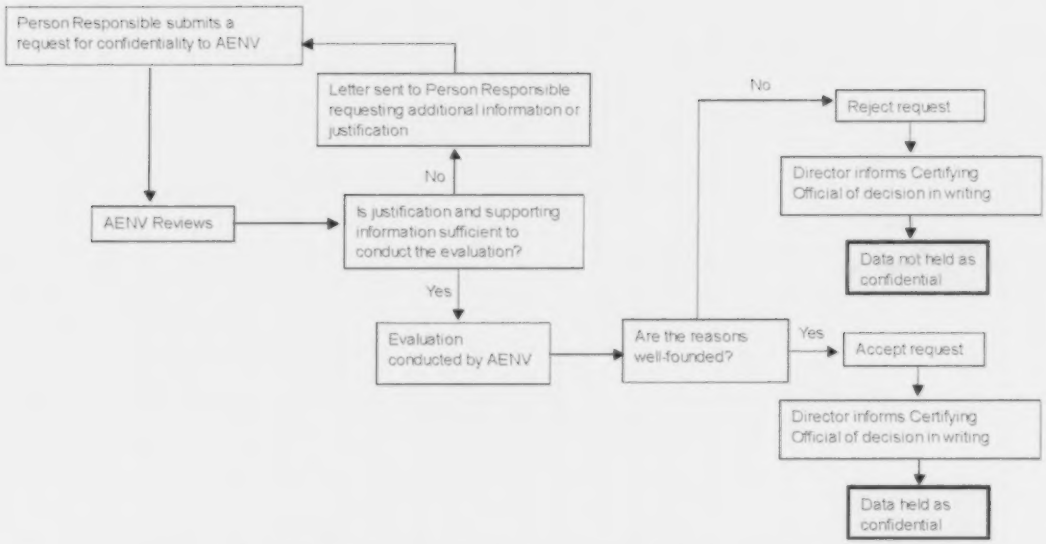
Person Responsible submits a request for confidentiality to AENV
Letter sent to Person Responsible requesting additional information or justification
No
AENV Reviews
Is justification and supporting information sufficient to conduct the evaluation?
Yes
Evaluation conducted by AENV
Are the reasons well-founded?
No
Reject request
Director informs Certifying Official of decision in writing
Data not held as confidential
Yes
Accept request
Director informs Certifying Official of decision in writing
Data held as confidential

Figure 12: Confidentiality process for the *Specified Gas Reporting Program*.

7.2 2009 confidentiality requests and decisions

There were six Alberta facilities that submitted confidentiality requests to Alberta Environment for the 2009 reporting period. All six facilities requested that Section A of their report be kept confidential. Section A of the 2009 specified gas report contains detailed greenhouse gas emissions by source category. One of the six facilities additionally requested that Section E of the report, containing additional comments and information about the facility, be kept confidential. The Director granted confidentiality for all six requests. Table 5 shows the facilities that requested confidentiality for 2009 and the corresponding decision by the Director.

Table 5: Confidentiality request decisions for 2009 greenhouse gas data.

Company Name	Facility Name	Decision:
Imperial Oil	Cold Lake	Section A deemed confidential for 5 years.
Petro-Canada	Edmonton Refinery	Section A and Section E deemed confidential for 5 years.
Graymont	Exshaw	Section A deemed confidential for 5 years.
Shell Canada Limited	Shell Scotford Refinery	Section A deemed confidential for 5 years.
Imperial Oil	Strathcona Refinery	Section A deemed confidential for 5 years.
Air Products	Edmonton Hydrogen	Section A deemed confidential for 5 years.

7.3 Publishing greenhouse gas data

Section 7 of the *Specified Gas Reporting Regulation* permits the Director to publish data and information in any specified gas report in any form or manner the Director considers appropriate. Alberta Environment has published an annual report on the results of the *Specified Gas Reporting Program* since 2003 when the mandatory greenhouse gas reporting program began.

7.4 Requesting greenhouse gas data

Written requests for information contained in a submitted specified gas report that has not been deemed confidential can be submitted to the designated Director at AENV.GHG@gov.ab.ca. The Director shall respond to these requests within a reasonable amount of time. The process for requesting non-confidential greenhouse gas data from Alberta Environment is outlined in Figure 13.

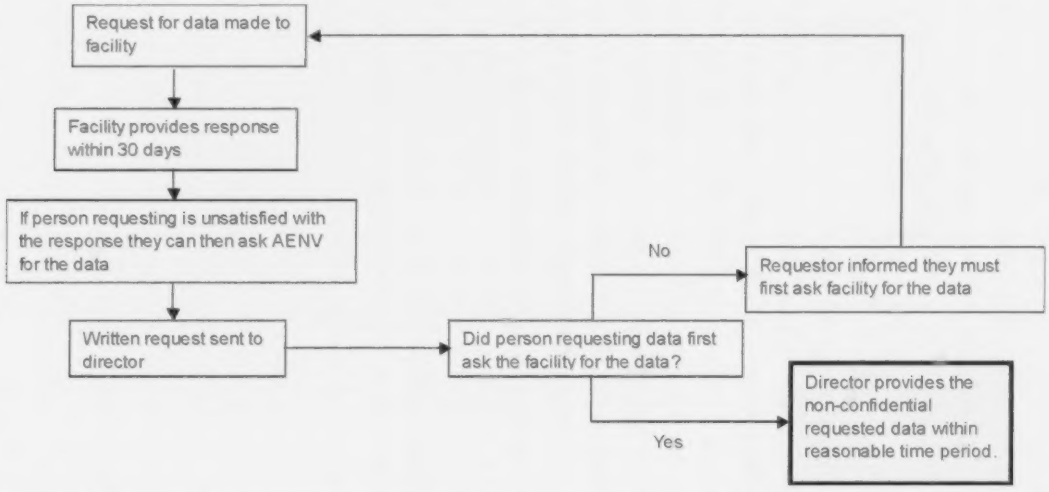
Request for data made to facility
Facility provides response within 30 days
If person requesting is unsatisfied with the response they can then ask AENV for the data
Written request sent to director
Did person requesting data first ask the facility for the data?
No
Requestor informed they must first ask facility for the data
Yes
Director provides the non-confidential requested data within reasonable time period.

Figure 13: Process for requesting non-confidential greenhouse gas data from Alberta Environment.

Glossary of Terms

Biomass: Plant materials, animal waste or any product made of either of these and includes without limitation wood and wood products, charcoal, agricultural residues and wastes including organic material above and below ground, both living and dead, such as trees, crops, grasses, tree litter, roots, municipal and industrial wastes where the organic material is biological in origin, landfill gas, bio-alcohols, black liquor, sludge gas, animal or plant-derived oils.

Carbon dioxide (CO_2): Carbon dioxide is a colourless, odourless gas found in the air. It is absorbed by plants and exhaled by animals. Carbon dioxide is also a greenhouse gas that traps infrared radiation in the atmosphere. The main human activity that produces carbon dioxide is the combustion of fossil fuels such as coal, oil, natural gas in power plants, vehicles and industrial facilities.

Carbon dioxide equivalent (CO_2e): Carbon dioxide equivalent is the concentration of CO_2 that would cause the same amount of absorption of infrared radiation in the atmosphere as another greenhouse gas. CO_2e is calculated by multiplying the emissions of a greenhouse gas by an established global warming potential to get an equivalent quantity of carbon dioxide. Using CO_2e permits the calculation of total greenhouse gas emissions for a particular source.

Direct emission: The release of specified gases from sources actually located at a facility, expressed in tonnes on a CO_2e basis.

Electronic Data Reporting System: The Electronic Data Reporting System is a one-window secure web-based reporting tool for facilities to report greenhouse gas emissions to under the *Specified Gas Reporting Program* and the *National Mandatory Greenhouse Gas Reporting Program*.

Emissions: Emissions are a quantity of a substance that is released to the air from a source.

Emissions intensity: Emissions intensity is the ratio of greenhouse gas emission values to associated production values. Production values can include Gross Domestic Product, barrels of oil, tonne of coal, megawatt hour of electricity, or other appropriate metrics.

Facility: Any plant, structure or thing where an activity listed in Section 2 of the Schedule of Activities to the *Environmental Protection and Enhancement Act* occurs, and a site or one or more contiguous or adjacent sites that are operated and function in an integrated fashion where an activity listed in any of Sections 3 to 11 of the Schedule of Activities to the *Environmental Protection and Enhancement Act* occurs, including all the buildings, equipment, structures, machinery and vehicles that are an integral part of the activity.

Flaring emissions: Flaring emissions are direct emissions from the controlled combustion of a gas or liquid stream produced on site not for the purpose of producing energy and includes without limitation emissions arising from waste petroleum incineration, hazardous emissions prevention systems (whether in pilot or active mode), well testing, natural gas gathering systems,

processing plant operations, crude oil production, pipeline operations, petroleum refining and chemical fertilizer and steel production.

Global warming potential: Global warming potential is the relative measure of the warming effect that the emission of a specified gas might have on the Earth's atmosphere calculated as the ratio of the time-integrated radiative forcing that would result from the emission of one kilogram of a given specified gas to that from the emission of one kilogram of carbon dioxide.

Greenhouse gases: Greenhouse gases are any gas that absorbs infrared radiation in the Earth's atmosphere. Greenhouse gases can come from both natural and human activities. Common greenhouse gases that result from human activities include carbon dioxide, methane and nitrous oxide.

Hydrofluorocarbons (HFCs): Hydrofluorocarbons are synthetic industrial gases emitted in small quantities but are powerful greenhouse gases with global warming potentials of hundreds to thousands of times that of carbon dioxide. Hydrofluorocarbons include the following HFC Species: CHF_3, CH_2F_2, CH_3F, $C_5H_2F_{10}$ (structure: $CF_3CHFCHFCF_2CF_3$), C_2HF_5, $C_2H_2F_4$ (structure: CHF_2CHF_2), $C_2H_2F_4$ (structure: CH_2FCF_3), $C_2H_3F_3$ (structure: CHF_2CH_2F), $C_2H_3F_3$ (structure: CF_3CH_3), $C_2H_4F_2$ (structure: CH_3CHF_2), C_3HF_7 (structure: CF_3CHFCF_3), $C_3H_2F_6$ (structure: $CF_3CH_2CF_3$) and $C_3H_3F_5$ (structure: $CH_2FCF_2CHF_2$). Only HFC emissions from industrial process and industrial product use are reported under the *Specified Gas Reporting Program*. Sources of HFC emissions from industrial process and industrial product use include emissions from foam blowing and the use of HFC as a cover gas in metal production. HFC emissions from other applications such as refrigeration, air conditioning, aerosol propellants, fire extinguishers, some solvents, etc, are not considered industrial process or industrial product use and are not reported under the *Specified Gas Reporting Regulation*.

Industrial process emissions: Direct emissions from an industrial process involving chemical or physical reactions, other than combustion, and where the primary purpose of the industrial process is not energy production. This includes mineral, metal and chemical production. This source category is more sector-specific than stationary fuel combustion and is not found in all industrial sectors.

Kilotonne: One thousand tonnes. Designated by kt.

Megatonne: One million tonnes. Designated by Mt.

Methane (CH_4): Methane is a colourless, odourless, flammable gas formed naturally by the decomposition of organic matter. Methane is also a greenhouse gas that traps infrared radiation in the atmosphere. Methane has a global warming potential 21 times that of carbon dioxide. Natural sources of methane include wetlands, permafrost, termites, water bodies and forest fires. Methane is also a hydrocarbon gas and is the principal constituent of natural gas. Human activities that are sources of methane emissions include fossil fuel production, animal husbandry, rice cultivation, biomass burning, and waste management.

Nitrous oxide (N_2O): Nitrous oxide is a colourless, non-flammable gas with a sweet odour. Nitrous oxide is also a powerful greenhouse gas that traps infrared radiation in the atmosphere. Nitrous oxide has a global warming potential 310 times that of carbon dioxide. Nitrous oxide is produced naturally from a wide variety of biological sources in soil and water, particularly microbial action in wet tropical forests. Human activities that are sources of nitrous oxide include agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, and some chemical production.

On-site transportation emissions: On-site transportation is a greenhouse gas source category with direct emissions resulting from fuel combustion in machinery used for the on-site transportation of products and material integral to the production process. Examples are the transportation of raw or intermediate products and materials within the production process; such as equipment used at an oil sands operation to mine and/or move materials to subsequent on-site processing, or equipment used at above or below ground mining operations to mine and/or move mined materials or other intermediate products or materials to different on-site production processes.

Fugitive/other emissions: Fugitive/other emissions are direct emissions that do not fall under stationary fuel combustion emissions, industrial process emissions, venting emissions, flaring emissions, on-site transportation emissions, or waste and wastewater emissions and includes without limitation intentional or unintentional releases of gases arising from the production, processing, Rtransmission, storage and use of solid, liquid or gaseous fuels. In general, emissions from fugitive/other sources are a result of the handling or processing of various types of fuel in the fossil fuel industry. Fugitive/other sources include leaks from natural gas transmission lines and processing plants, accidental releases from oil and gas wells and releases from the mining and handling of coal.

Perfluorocarbons (PFCs): Perfluorocarbons are synthetic industrial gases emitted in small quantities but are powerful greenhouse gases with global warming potential of hundreds to thousands of times that of carbon dioxide. Perfluorocarbons include the following PFC species: CF_4, C_2F_6, C_3F_8, C_4F_{10}, c-C_4F_8, C_5F_{12}, and C_6F_{14}. Only PFC emissions from industrial process and industrial product use are reported under the *Specified Gas Reporting Program*. Sources of PFC emissions from industrial process and industrial product use include aluminum production and foam blowing.

Specified gas: Specified gases are those identified in the *Specified Gas Reporting Regulation*. This includes: carbon dioxide, methane, nitrous oxide, species of hydrofluorocarbons, species of perfluorocarbons and sulphur hexafluoride.

Stationary fuel combustion emissions: Stationary fuel combustion emissions are direct emissions resulting from non-vehicular combustion of fossil or biomass fuel for the purpose of producing energy but do not include biomass combustion CO_2 emissions. Stationary fuel combustion is a common source of greenhouse gas emissions and is produced in most industrial sectors. The stationary fuel combustion source category includes on-site waste incineration if the waste is combusted for the purpose of energy production.

Sulphur hexafluoride (SF_6): Sulphur hexafluoride is a synthetic industrial gas that is emitted in small quantities but is a powerful greenhouse gas with a global warming potential thousands of times that of carbon dioxide. Only SF_6 emissions from industrial process and industrial product use are reported under the *Specified Gas Reporting Program*. Sources of SF_6 from industrial process and industrial product use are uses such as a cover gas in magnesium smelting and casting, as foundry products in the aluminum industry, or as an insulting gas in electrical equipment such as circuit breakers. SF_6 emissions from other applications such as fire suppression, explosion protection, leak detection and electronic applications are not considered industrial process or industrial product use and are not reported under the *Regulation*.

Venting emissions: Venting emissions are direct emissions from intentional releases to the atmosphere of a waste gas or liquid stream and includes without limitation emissions of casing gas, associated (or solution) gas, treater, stabilizer, dehydrator off-gas, blanket gas and emissions from pneumatic devices which use natural gas as a driver, compressor start-up, pipeline and other blowdowns and metering and regulation station control loops.

Waste and wastewater emissions: Waste and wastewater emissions are direct emissions from disposal of waste and waste or wastewater treatment and includes without limitation sources of emissions from on-site waste disposal and waste or wastewater treatment at a facility such as landfilling of solid waste, flaring of landfill gas, treatment of liquid waste and waste incineration.

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